Products

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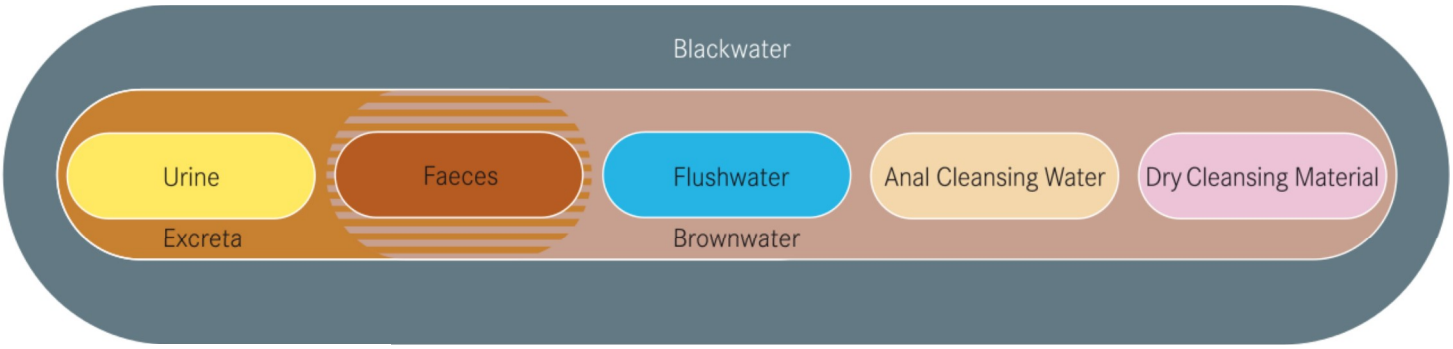

Products are materials that are also called 'wastes' or 'resources'. Some products are generated directly by humans (e.g. Urine and Faeces), others are required in the functioning of technologies (e.g. Flushwater to move excreta through sewers) and some are generated as a function of storage or treatment (e.g. Sludge). For the design of a robust sanitation system, it is necessary to define all of the products that are flowing into (inputs) and out of (outputs) each of the sanitation technologies in the system. The products referenced within this text are described below.

Anal Cleansing Water is water used to cleanse oneself after defecating and/or urinating; it is generated by those who use water, rather than dry material, for anal cleansing. The volume of water used per cleaning typically ranges from 0.5 L to 3 L.

Biogas is the common name for the mixture of gases released from anaerobic digestion. Biogas is comprised of methane (50 to 75%), carbon dioxide (25 to 50%) and varying quantities of nitrogen, hydrogen sulphide, water vapour and other components. Biogas can be collected and burned for fuel (like propane).

Biomass refers to plants or animals cultivated using the water and/or nutrients flowing through a sanitation system. It may include fish, insects, vegetables, fruit, forage or other beneficial crops which can be utilized for food, feed, fibre and fuel production.

Blackwater is the mixture of Urine, Faeces and Flushwater along with Anal Cleansing Water (if water is used for cleansing) and/or Dry Cleansing Materials (see Figure). Blackwater contains the pathogens of Faeces and the nutrients of Urine that are diluted in the Flushwater.

Brownwater is the mixture of Faeces and Flushwater, and does not contain Urine. It is generated by **Urine Diverting Flush Toilets (/taxonomy/term/2660/uddt)** and, therefore, the volume depends on the volume of the Flushwater used. The pathogen and nutrient load of Faeces is not reduced, only diluted by the Flushwater. Brownwater may also include Anal Cleansing Water (if water is used for cleansing) and/or Dry Cleansing Materials.

Compost is decomposed organic matter that results from a controlled aerobic degradation process.In this biological process, microorganisms (mainly bacteria and fungi) decompose the biodegradable waste components and produce an earth-like, odourless, brown/black material. Compost has excellent soil-conditioning properties and a variable nutrient content. Because of leaching and volatilization, some of the nutrients maybe lost, but the material is still rich in nutrients and organic matter. Generally, Excreta or Sludge should be composted long enough (2 to 4 months) under thermophilic conditions (55 to 60 °C) in order to be sanitized sufficiently for safe agricultural use. This temperatureis not guaranteed in most **Composting Chambers (/factsheet/composting-chamber)**, but considerable pathogen reduction can normally beachieved.

Dried Faeces are Faeces that have been dehydrated until they become a dry, crumbly material. Dehydration takes place by storing Faeces in a dry environment with good ventilation, high temperatures and/or the presence of absorbent material. Very little degradation occurs during dehydration and this means that the Dried Faeces are still rich in organic matter. However, Faeces reduce by around 75% in volume during dehydration and most pathogens die off. There is a small risk that some pathogenic organisms can be reactivatedunder the right conditions, particularly, in humid environments.

Dry Cleansing Materials are solid materials used to cleanse oneself after defecating and/or urinating

(e.g., paper, leaves, corncobs, rags or stones). Depending on the system, Dry Cleansing Materials may be collected and separately disposed of. Although extremely important, a separate product name for menstrual hygiene products like sanitary napkins and tampons is not included in this Compendium. In general (though not always), they should be treated along with the solid waste generated in the household.

Effluent is the general term for a liquid that leaves a technology, typically after Blackwater or Sludge has undergone solids separation or some other type of treatment. Effluent originates at either a Collection and Storage or a (Semi-) Centralized Treatment technology. Depending on the type of treatment, the Effluent maybe completely sanitized or may require further treatment before it can be used or disposed of.

Excreta consists of Urine and Faeces that is not mixed with any Flushwater. Excreta is small in volume, but concentrated in both nutrients and pathogens. Depending on the quality of the Faeces, it has a soft or runny consistency.

Faeces refers to (semi-solid) excrement that is not mixed with Urine or water. Depending on diet, each person produces approximately 50 L per year of faecal matter. Fresh faeces contain about 80% water. Of the total nutrients excreted, Faeces contain about 12% N, 39% P, 26% K and have 10^7 to 10^9 faecal coliforms in 100 mL.

Flushwater is the water discharged into the User Interface to transport the content and/or clean it. Freshwater, rainwater, recycled Greywater, or any combination of the three can be used as a Flushwater source.

Greywater is the total volume of water generated from washing food, clothes and dishware, as well as from bathing, but not from toilets. It may contain traces of Excreta (e.g., from washing diapers) and, therefore, also pathogens. Greywater accounts for approximately 65% of the wastewater produced in households with flush toilets.

Organics refers to biodegradable plant material (organic waste) that must be added to some technologies in order for them to function properly (e.g., Composting Chambers). Organic degradable material can include, but is not limited to, leaves, grass and market waste. Although other products in

this Compendium contain organic matter, the term Organics refers to undigested plant material.

Pit Humus is the term used to describe the nutrient-rich, hygienically improved, humic material that is generated in double pit technologies (Double Ventilated Improved Pit (VIP), Fossa Alterna, Twin Pits for Pour Flush). through dewatering and degradation. This earth-like product is also referred to as EcoHumus, a term conceived by Peter Morgan in Zimbabwe. The various natural decomposition processes taking place in alternating pits can be both aerobic and anaerobic in nature, depending on the technology and operating conditions. The main difference between Pit Humus and Compost is that the degradation processes are passive and are not subjected to a controlled oxygen supply, C:N ratio, humidity and temperature. Therefore, the rate of pathogen reduction is generally slower and the quality of the product, including its nutrient and organic matter content, can vary considerably. Pit Humus can look very similar to Compost and have good soil conditioning properties, although pathogens may still be present.

Pre-Treatment Products are materials separated from Blackwater, Brownwater, Greywater or Sludge in preliminary treatment units, such as screens, grease traps or grit chambers (see **Pre Treatments (/factsheet/pre-treatment-technologies)**). Substances like fats, oil, grease, and various solids (e.g. sand, fibres and trash), can impair transport and/or treatment efficiency through clogging and wear. Therefore, early removal of these substances is crucial for the durability of a sanitation system.

Sludge is a mixture of solids and liquids, containing mostly Excreta and water, in combination with sand, grit, metals, trash and/or various chemical compounds. A distinction can be made between faecal Sludge and wastewater Sludge. Faecal Sludge comes from onsite sanitation technologies, i.e., it has not been transported through a sewer. It can be raw or partially digested, a slurry or semisolid, and results from the Collection and Storage/Treatment of Excreta or Blackwater, with or without Greywater. For a more detailed characterization of faecal Sludge refer to **Strande et al., 2014 (http://www.sandec.ch/fsm_book)**. Wastewater Sludge (also referred to as sewage Sludge) is Sludge that originates from sewer-based wastewater collection and (Semi-) Centralized Treatment processes. The Sludge composition will determine the type of treatment that is required and the end-use possibilities.

Stored Urine is Urine that has been hydrolysed naturally over time, i.e., the urea has been converted by enzymes into ammonia and bicarbonate. Stored Urine has a pH of approximately 9. Most pathogens cannot survive at this pH. After 6 months of storage, the risk of pathogen transmission is considerably reduced.

Stormwater is the general term for the rainfall runoff collected from roofs, roads and other surfaces before flowing towards low-lying land. It is the portion of rainfall that does not infiltrate into the soil.

Urine is the liquid produced by the body to rid itself of urea and other waste products. In this context, the Urine product refers to pure Urine that is not mixed with Faeces or water. Depending on diet, human Urine collected from one person during one year (approx. 300 to 550 L) contains 2 to 4 kg of nitrogen. With the exception of some rare cases, Urine is sterile when it leaves the body.